World Nutrition Journal | eISSN 2580-7013

ORIGINAL PAPER

Fasting Plasma Glucose Concentration in Relation to Nutritional Status Indicator and Physical Activity Level Among Schizophrenia Patients

Received 22 February 2018,
Accepted 21 April 2018

Link to DOI:
10.25220/WNJ.V02.i1.0001

Journal Website:
www.worldnutrijournal.org

Della MW Cintakaweni,[1] Saptawati Bardosono,[1] Hervita Diatri[2]

1. *Department of Clinical Nutrition, Medical Faculty Universitas Indonesia – Cipto Mangunkusumo General Hospital*
2. *Department of Psychiatry, Medical Faculty Universitas Indonesia*

Abstract

Introduction Diabetes mellitus often occurs in schizophrenia patients. This condition probably related to genetic, antipsychotic drugs and the development of schizophrenia which can lead to an unhealthy lifestyle, such as sedentary lifestyle and increased of dietary intake. **Methods** Cross-sectional study was held in Psychiatry Department Cipto Mangunkusumo Hospital in May to June 2014 to determine the correlation between fasting plasma glucose concentration in schizophrenia patient to their nutritional status indicator and physical activity level. **Results** Forty-seven subjects finished the study protocol. The result showed that the fasting plasma glucose concentration in schizophrenia patient has no correlation with nutritional status indicator and physical activity level, in which 91.5% subject had normal fasting plasma glucose. However, further investigation is needed because 31.9% subject were overweight, 48.9% subject were obese and 74.5% subject had central obesity. **Conclusion** No correlation was found between fasting plasma glucose concentration with nutritional status indicators and physical activity in schizophrenia patients. However, most subjects had central obesity.

Keywords Diabetes mellitus, schizophrenia, fasting plasma glucose, nutritional status indicator, physical activity level

Introduction

Eating is human basic daily requirement as energy intake is needed to survive. Physical activity has a contribution in total energy expenditure. The balance between energy intake and energy expenditure will maintain a constant body weight by a complex system of chemical, hormonal and neural mechanisms. Abnormalities of these complex systems will result in weight fluctuations which may cause impairment in the body system.[1]

The body uses energy in form of glucose, which can be detected as blood glucose. The term hyperglycemia is a condition of high blood glucose concentration, which can be due to defects in insulin secretion, defects in insulin actions or both,[2] and any impairment in glucose homeostasis.[3] Chronic hyperglycemia may be caused by several conditions such as obesity and diabetes mellitus (DM). Obesity is also one of the risk factors of DM. In person with DM, abnormalities in the

Corresponding author:
Della MW Cintakaweni
Department of Clinical Nutrition, Medical Faculty, Universitas Indonesia
Email address : dellacintakaweni@gmail.com

metabolism of carbohydrate, protein and fat may present.[1] Furthermore, DM is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels.[2]

In relation to obesity and DM, as the main concern of this study, although schizophrenia is a severe form of the mental illness. Person with schizophrenia have a tendency to have lack of exercise and poor nutritional status (obesity) in which mostly affecting adult population.[4] This conditions may be the result from the illness itself or the medications.[5] In schizophrenia patients, the imbalance between high energy intake and low physical activity will cause obesity.[1] Obesity is known as one of the risk factor of insulin resistance with hyperglycemia as the symptom.[6] Studies by Sweileh,[7] Saddicha,[8] Cohen,[9] and De Hert,[10] supported that hyperglycemia occured in schizophrenia patients. On the other hand, Martynikhin[11] study showed that fasting glucose concentration in schizophrenia patient is generally normal.

There is more concern about these conditions because 60% of premature death in persons with schizophrenia is due to medical conditions, such as cardiovascular, pulmonary and infectious diseases. Cardiovascular diseases risk factors in schizophrenia, which are preventable, are obesity, smoking, DM, hypertension and dyslipidemia.[5] Thus, the need for screening, monitoring and prevention for cardiovascular disease in schizophrenia patients since the initial diagnostic of schizophrenia is becoming important.[12] Thus, this study aims to see the correlation between fasting plasma glucose concentration to nutritional status indicators and physical activity level in schizophrenia patients.

Methods

Subjects

Sixty eight schizophrenia patients, age ranged between 19-59 years old, in Adult Clinic Psychiatry Cipto Mangunkusumo Hospital were recruited. They were diagnosed by the psychiatrist and screened accordingly to the study criteria. The subjects agreed to participate by signing the informed consent and they were assured that all information were confidential. Then they followed the interview, anthropometric measurements and food recall training for filling their 4-day food record. All subjects were informed to come again one week after their recruitment and after 12 hours of overnight fasting for the laboratory fasting glucose concentration measurement. Medical Ethics Committee of Universitas Indonesia has approved the study protocol, and 47 subjects as the minimal sample size for a correlation study with an assumption of 0.4 as coefficient of correlation value, had finished the study protocols.

Measurements

Data collection was done in May to June 2014. Data collected consisted of subject characteristics, antipsychotic medications during the study, family history of DM, weight, height and waist circumferences, physical activities, food histories and blood samples for fasting glucose concentration. Weight was measured using *Tanita*® digital scale, height was measured using a non-stretchable wall-meter and waist circumference was measured using the tape measurement. From the weight and height measurements, body mass index (BMI) was calculated. Physical activity level was measured by using International Physical Activity short form. Food recall and food record were then analyze with Nutrisurvey 2007 food processor programme with added indonesian food database which were then interpreted as total energy, carbohydrate, protein and fat intake. Fasting plasma glucose were determined enzymatically by using the hexokinase method.

Statistics

Data were analyzed with Kolmogorov-Smirnov test to check the normality distribution of each data. Pearson correlation test was used to analyze the correlations between variables by using SPSS statistical software version 20 for Windows operating system.

Results

The results showed 43 of 47 subjects (91.5%) had normal fasting plasma glucose. The subjects were mostly less than 40 years old (70.2%), male

(57.4%), not married (70%), and not working (70.2%). Most subjects had duration of schizophrenia for more than 2 years (85.1%). Around 85.1% subjects had atypical anti-psychotic mediation for more than 5 years (42.5%). Subject who routinely consumed medication was 95.7%. Subject who were prescribed polypharmacy medications are 57.4%. In terms of nutritional status, 80.8% were overweight-obese and mostly having abdominal or central obesity (74.5%). Almost all the subjects had low-moderate physical activity level. However, there was no significant difference between the subject's characteristics, dietary intake, nutritional status, and physical activities to fasting plasma glucose concentration (Table 1).

Table 2 shows the correlation between fasting plasma glucose concentration with nutritional status indicators and physical activity level in schizophrenia patients. There were no correlation between BMI, waist circumference, total dietary, carbohydrate, protein and fat intake with fasting plasma glucose concentration.

Discussion

To our knowledge, this is the first study in Indonesia to investigate the correlation between fasting plasma glucose concentration with nutritional status indicator and physical activity in schizophrenia patients. In this study, only 8.5% subjects had abnormal fasting plasma glucose. However, regarding to the very high proportions of overweight-obesity (80.8%) and central obesity (74,5%), this study revealed an unexpected finding, i.e. most of the subject's dietary intake were balance with their physical activity and they have a normal fasting plasma glucose.

All subjects with abnormal fasting plasma glucose were below 40 years old. This differs from De Hert study[10] in which the subjects with schizophrenia have the highest tendency of glucose abnormalities at age over 40 years old. In this study, probably only subject with good physical ability could visit the psychiatry clinic at Cipto Mangunkusumo Hospital. Thus, subjects out of the hospital should be included. Fasting plasma glucose abnormality in this study affected only 2.1% versus 6.4% subjects with duration of illness less than 2 years and more than 2 years, respectively. This finding is similar to De Hert[10] study which showed the lowest glucose abnormalities in schizophrenia subject was among those patients with duration of illness less than 1.5 years. The glucose abnormalities were higher in subject with longer duration of illness. Thus the risk of glucose abnormalities may already happen at the beginning of the disease and will increase with longer duration of illness. Furthermore, 8.5% subject with glucose abnormalities in this study received atypical antipsychotic. This result is similar to Haider[16] study in which 8% subject had glucose abnormality. However the mechanism between antipsychotic and hyperglycemia was not investigated in this study.

Dietary intake between subjects in this study was different because it was highly dependent to their family daily food. Most of the subjects have higher fat intake which may be one of the risk factor of obesity for this study's subjects. In addition, 48.9% subjects had low–moderate physical activity, which is different to Yamamoto[17] study, i.e. schizophrenia subject had a low physical activity. It is widely known that low physical activity will need low energy requirement, thus will cause obesity if the total dietary intake was higher. Furthermore, obese subjects with low physical activity may results in metabolic overload in the liver and muscle, then ends with pancreatic beta cell failures.

In this study, no correlation was found between blood fasting plasma glucose concentration with nutritional status indicators and physical activity in schizophrenia patients. This may be due to most of the subjects had normal fasting plasma glucose eventhough they were obese and have low physical activity. However, more than 50% subjects in this study had central obesity, which is known as one of the risk factors for insulin resistance and metabolic syndrome. Patients with metabolic syndrome has double higher risk for death and triple higher risk to have heart attack or stroke compared to those without.

There are some limitations in this study, namely subject's variations, financial problem and family

Table 1. Characteristics of subject schizophrenia, the nutritional status and physical activity compare with fasting plasma glucose concentration (n=47)

Variable	Fasting plasma glucose concentration		p
	<100 mg/dl (n=43)	100–125 mg/dl (n=4)	
Age			0.397
19 – <40 years	29	4	
40 – 59 years	14	0	
Sex			0.425
Male	29	3	
Female	14	1	
Marriage status			0.169
Married or divorce	14	2	
Single	29	2	
Education			0.881
Not graduated from Junior high	5	0	
Junior high graduated and above	38	4	
Work			0.753
Work	13	1	
Not working	30	3	
Duration of schizophrenia			0.822
<2 years	6	1	
>2 years	37	3	
DM history in family			0.417
Yes	13	1	
No	30	3	
Antipsychotic			0.413
Typical	5	0	
Atypical	36	4	
Combination	2	0	
Antipsychotic consumption			0.864
Routine	41	4	
Not routine	2	0	
Duration antipsychotic medication			0.260
<5 years	23	4	
≥5 years	20	0	
Medication			0.526
Monopharmacy*	17	3	
Polypharmacy**	26	1	
BMI (kg/m^2)			0.494
<18,5 kg/m^2	2	0	
18,5 – <23 kg/m^2	7	0	
23 – 27,5 kg/m^2	12	3	
>27,5 kg/m^2	22	1	
Waist circumference			0.130
Male <90 cm	9	0	
Male ≥90 cm	15	3	
Female <80 cm	3	0	
Female ≥80 cm	16	1	
Physical activity			0.524
Low <600 MET minute/week	22	1	
Moderate 600 – 3000 MET minute/week	20	3	
High >3000 MET minute/week	1	0	

Note: *one type of medication (typical or atypical); **combination of typical and atypical medication

Table 2. Correlation between fasting plasma glucose concentration with nutritional status indicators and physical activity in schizophrenia patients

Nutritional status	Fasting Plasma Glucose	
	r	p value
BMI	-0.005	0.972
Waist circumference	0.101	0.498
Total dietary intake	-0.046	0.760
Carbohydrate intake	0.017	0.911
Protein intake	0.026	0.862
Fat intake	-0.196	0.187
Physical activity	0.087	0.562

support to finish the protocol. Their awareness on the importance of family support in the treatment of schizophrenia subject to prevent the cardiovascular events was not good enough.

In conclusion, there was no correlation found between blood fasting plasma glucose concentration with nutritional status indicators and physical activity level in schizophrenia patients in this study. However, there was a high proportion of central obesity found in this study, which indicated schizophrenia may be associated with metabolic syndrome. Thus, the present findings can be regarded as a small step forward practical implication for clinicians. Further investigations are suggested to detect other cardiovascular risk factors in schizophrenia patients.

Conflict of Interest

Authors declared no conflict of interest regarding this study.

Open Access

Acknowledgement

The authors would like to acknowledge staff in Department of Psychiatry, Faculty of Medicine, Universitas Indonesia for helping with this paper.

References

1. Mahan LK, Escott-stump S, Raymond JL, editor. *Krause's Food and the Nutrition Care Process*. 13th edition. Missouri: Elsevier Saunders, 2012.
2. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care* 2012;35(1):s64-s71.
3. Marks DB. *Basic Medical Biochemistry – A Clinical Approach*.
4. World Health Organization. Schizophrenia. Available at: http://www.who.int/mental_health/management/schizophrenia/en/ (accessed in August 5, 2013).
5. Parks J, Svendsen D, Singer P, Foti ME. *Morbidity and mortality in people with serious mental illness*. National Association of State Mental Health Program Directors. Alexandria; 2006.
6. Parks J, Svendsen D, Singer P, Foti ME. *Morbidity and mortality in people with serious mental illness*. National Association of State Mental Health Program Directors. Alexandria; 2006.
7. Sweileh WM, Dalal SA, Zyoud SH, Al-jabi SW, Al-ali I. Diabetes mellitus in patients with schizophrenia in West-Bank, Palestine. *Diabetes Res Clin Pract* 2013;1–7.
8. Saddichha S, Manjunatha N, Ameen S, Akhtar S. Diabetes and schizophrenia–effect of disease or drug ? Results from a randomized, double–blind, controlled prospective study in first-episode schizophrenia. *Acta Psychiatr Scand*. 2008;117(7):342–347.
9. Cohen D, Grobee DE, Wied CCG, Stolk RP. Hyperglycemia and diabetes in patients with schizophrenia or schizoaffective disorders. *Diabetes Care* 2006;29:786–791.
10. De Hert M, Winkel R, Eyck DV, Hanssens L, Wampers M, Sheen A dkk. Prevalence of diabetes, metabolic syndromme and metabolic abnormalities in schizophrenia over the course of the illness: a cross- sectional study.

Clinical Practice and Epidemiology in Mental Health 2006;2:14.
11. Martynikhin I, Tanyanskiy D, Rotar O, Solntsev V, Sokolian N, Neznanov N dkk. Risk of metabolic syndrome in patients with schizophrenia: comparative study with population od bank employees in Rusia. *Archives of Psychiatry and Psychotherapy* 2013;2: 15–20
12. De Hert M, Vancampfort D, Correll CU, Mercken V, Peuskens J, Sweeres K, dkk. Guidelines for screening and monitoring of cardiometabolic risk in schizophrenia: systemic evaluation. *Br J Psychiatry* 2011;199:99-105.
13. National Institute of Mental Health. Schizophrenia. Available at: http://www.nimh.nih.gov/statistics/1schiz.shtml (accessed in August 5, 2013)
14. From curing to caring: Achieving Patient's Recovery. *Rekomendasi Tata Laksana Layanan Skizofrenia. Perhimpunan Dokter Spesialis Kedokteran Jiwa Indonesia*. 2014
15. *Konsensus Penatalaksanaan Gangguan Skizofrenia. Perhimpunan Dokter Spesialis Kedokteran Jiwa Indonesia*. 2011
16. Haider Z, Niazi ZK, Dars JA, Afridi I. Hyperglycemia and treatment with antipsychotics – A study from a tertiary care centre. *JPPS* 2011;8(2):69- 73.
17. Yamamoto H, Yamamoto K, Miyaji S, Yukawa-inui M, Hori T, Tatematsu S, dkk. Daily physical activity in patients with schizophrenia. *Kitasato Med* 2011;41:145–53.